1.0 INTRODUCTION

DOE Order 450.1, *Environmental Protection Program,* requires each DOE site to conduct environmental monitoring. Environmental monitoring at WIPP is conducted to:

- Verify and support compliance with applicable federal, state, and local environmental laws, regulations, permits, and orders.
- Establish baselines and characterize trends in the physical, chemical, and biological condition of effluent and environmental media.
- Identify potential environmental problems and evaluate the need for remedial actions or measures to mitigate the problem.
- Detect, characterize, and report unplanned releases.
- Evaluate the effectiveness of effluent treatment and control and pollution abatement programs.
- Determine compliance with commitments made in environmental impact statements, environmental assessments, safety analysis reports, or other official DOE documents.

This EMP has been written to contain the rationale and design criteria for the monitoring program, extent and frequency of monitoring and measurements, procedures for laboratory analyses, quality assurance (QA) requirements, program implementation procedures, and direction for the preparation and disposition of reports. Changes to the environmental monitoring program may be necessary to allow the use of advanced technology and new data collection techniques.

This EMP will document any proposed changes in the environmental monitoring program. This document is prepared for WIPP in accordance with the guidance contained in applicable sections of *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (DOE/EH-0173T; DOE, 1991); and the Title 10 *Code of Federal Regulations* (CFR) Part 834, "Radiation Protection of the Public and Environment" (draft). The WIPP Project is operated by Washington TRU Solutions LLC (WTS) for the DOE.

This plan defines the extent and scope of WIPP's effluent and environmental monitoring and hydrology programs during the facility's operational life and also discusses WIPP's quality assurance/quality control (QA/QC) program as it relates to environmental monitoring.

In addition, this plan provides a comprehensive description of environmental activities at WIPP including:

- A summary of environmental programs, including the status of environmental monitoring activities.
- A description of the WIPP Project and its mission.
- A description of the local environment.
- An overview of the methodology used to assess radiological consequences to the public.

Environmental activities at the WIPP Project generally fall into four categories: (1) collect environmental samples in various matrices and analyze them for specific radionuclides; (2) prepare and publish documents showing compliance with federal, state, and local regulations; (3) evaluate whether WIPP activities caused any environmental impacts; and (4) take corrective action when an adverse effect on the environment is identified due to any radiological or nonradiological source.

A number of provisions taken to mitigate potential environmental impacts appear in statements of work issued to all contractors involved in the operation of the WIPP facility. These provisions are listed below:

- Protection of environmental resources, including avoidance of unnecessary damage to vegetation, wildlife, and soil by controlling traffic, minimizing disturbance zones, and cleaning up spills
- Protection of air resources, including the control of hydrocarbon emissions by using proper fuels, the suppression of dust by spraying with water, and the monitoring and control of noise
- Protection of water resources, including the use of retention ponds such as the sewage treatment system for controlling suspended materials, solutes, and other pollutants
- Preservation and recovery of historical, archaeological, and cultural resources, including the interruption of construction activities as necessary to investigate and mitigate impacts to historical or archaeological resources
- Post-construction reclamation, including the removal of temporary construction facilities, access roads, stockpiles, and work areas, as well as the restoration of all damaged landscape features outside the limits of approved work areas.

WIPP must also comply with specified permitting and approval requirements of several federal and state regulating agencies.

2.0 PROJECT DESCRIPTION

The primary purpose of WIPP is to dispose of mixed transuranic (TRU) waste. Mixed wastes are those containing both radioactive and hazardous constituents. The WIPP is allowed to dispose of waste generated by the defense-related activities of the U.S. Government that are specified in the WIPP Hazardous Waste Facility Permit (NMED, 1999).

Contact-handled (CH) waste is being received and disposed of at the WIPP facility. The CH waste consists of TRU waste that has a surface dose rate of 200 mrem/hr (millirem per hour) or less and therefore lends itself to direct handling. Remote-handled (RH) waste will be received and disposed of at the WIPP facility in the future when the appropriate permit modification is obtained from the state of New Mexico. The RH waste is TRU waste that, due to higher levels of penetrating radiation, must be shielded and handled remotely. Waste will be classed as RH when surface dose rate is greater than 200 mrem/hr. TRU waste is radioactive waste that, without regard to source or form, is contaminated with alpha-emitting TRU radionuclides having atomic numbers larger than 92 and half-lives longer than 20 years in concentrations greater than 100 nanocuries per gram of waste.

Waste is delivered to the WIPP Waste Handling Building via semitrailer trucks. CH TRU waste is shipped in packages known as TRUPACT-IIs (transuranic package transporters). TRUPACT-IIs are durable Type B Nuclear Regulatory Commission (NRC)-certified transport containers designed to accommodate standard waste boxes, ten-drum overpacks, and drums. RH TRU waste will be packaged in waste canisters and shipped to WIPP in NRC-certified, special transportation casks.

The disposal rooms prepared for the waste have been excavated from the Salado Formation, a thick sequence of salt beds deposited 250 million years ago (Permian age). The disposal horizon is located at a depth of 655 meters (2,150 feet).

Within the Waste Handling Building (WHB), waste containers are removed from the TRUPACT-II, secured to a facility pallet for transportation, then placed on the waste-handling hoist and lowered to the disposal horizon. Waste containers are then removed from the hoist and emplaced within the disposal rooms.

When a room is deemed full, ventilation barriers are erected. At that time, waste disposal in the next disposal room commences. When all of the rooms of a panel are full, bulkheads will be installed to seal the panel.

When WIPP is decommissioned, specially designed seals, and closure systems will be placed in the excavated shafts and in the drifts. Geologic pressures and the plasticity of the salt will result in the excavation's gradual closure due to creep. This closure will encapsulate and isolate any waste within the Salado Formation.

The underground area is ventilated by air entering via the salt-handling, air-intake, and waste-handling shafts and exiting through the exhaust shaft. In the event of an accident

involving waste in the underground, waste-handling activities will cease. Air from the exhaust shaft will be directed, at a reduced flow rate, through the Exhaust Filter Building, which contains banks of high-efficiency particulate air (HEPA) filters in order to remove potentially contaminated particulate. Exhaust ventilation from the WHB is continuously HEPA filtered and is not expected to represent a significant release point. Effluent monitoring is discussed in Section 5.0.

3.0 SITE CHARACTERISTICS

3.1 Geography

WIPP is located in Eddy County in southeastern New Mexico (Figure 3-1) within the Pecos Valley section of the southern Great Plains physiographic province (Powers et al., 1978). The site is 42 km (26 miles) east of Carlsbad in an area known as Los Medaños (the dunes). Los Medaños is a relatively flat, sparsely inhabited plateau with little surface water. The WIPP site (Figure 3-2) consists of 16 sections of federal land in Township 22 South, Range 31 East.

3.2 Geology

Los Medaños soils are sandy and well drained, with a well-developed caliche layer occurring below one meter. There are no integrated natural surface drainage features at the site. Scattered throughout the local area are numerous livestock watering ponds (tanks) and shallow playas which retain water sporadically. These playas are located approximately seven miles southwest of the site. Geologically, the site is located in the northern portion of the Delaware Basin, one of the western-most sedimentary basins known collectively as the Permian Basin. Figure 3-3 illustrates the local stratigraphy.

3.3 Climatology

Regional climate is semiarid with generally warm temperatures. Average annual precipitation is approximately 31 centimeters (12 inches). About half of the precipitation is received from June through September in the form of high intensity-short duration thunderstorms. Daytime summer temperatures consistently exceed 32°C (90°F) and often rise above 38°C (100°F). Winter temperatures often rise as high as 21°C (70°F) during the afternoon. Nighttime lows during winter average near -5°C (23°F), occasionally dipping below -10°C (14°F). Prevailing winds are from the southeast; however, strong winds are common and can blow from any direction, creating potentially violent windstorms which carry large volumes of dust and sand. The wind direction and velocity data have remained essentially the same from year to year. Compilations of climatic data are provided in the annual Site Environmental Report (SER) (DOE, 2003a).

3.4 Hydrology

The nearest large surface water body is located approximately 13 kilometers (eight miles) west-southwest of the WIPP site in Nash Draw. The Pecos River is located 22.4 kilometers (14 miles) southwest of the WIPP site.

Several water-bearing zones have been studied near WIPP. The most significant are the Culebra and Magenta members of the Rustler Formation, which consist primarily of fractured dolomite. These dolomite units produce brackish to saline water. Another saline water-bearing zone identified is the Rustler-Salado contact, which contains very little water at the WIPP site. It was exposed during shaft construction and produced

only a small amount of brine seepage. Other water-bearing zones that have been evaluated as part of site characterization include the Dewey Lake Redbeds and the overlying Triassic Dockum Group and the Bell Canyon and Castile Formations.

The Dewey Lake Formation (Figure 3-3), which contains limited amounts of fresh water, is composed of alternating thin, even beds of siltstone and mudstone with lenticular interbeds of fine-grained sandstone. Exploratory drilling during site hydrogeologic evaluation did not identify a continuous zone of saturation within the Dewey Lake. The few Dewey Lake wells yielding water for domestic and stock purposes are believed to be completed in the thin, discontinuous lenticular sands where favorable groundwater recharge occurs (Mercer, 1983).

Shallow subsurface water (SSW) occurs beneath the WIPP site at a depth of less than 100 feet below ground surface at the contact between the lower Santa Rosa Formation and the upper Dewey Lake Formation. This SSW yields generally less than 1 gallon per minute in monitoring wells and piezometers (PZs) and contains high concentrations of total dissolved solids (TDS) and chlorides. The origin of this water is believed to be primarily from anthropogenic causes, with some contribution from natural sources. The SSW occurs not only under the WIPP site surface facilities but also about a half mile south of the Waste Handling Shaft.

The SSW saturated zone occurs in the uppermost Permo-Triassic Dewey Lake Formation and basal Triassic Santa Rosa Formation. Some wells in the PZ series produced dry cuttings in the uppermost Dewey Lake Formation, indicating that saturation was limited to the Santa Rosa/Dewey Lake formational contact.

3.5 Ecology

The biota of Los Medaños represent a transition between the northern Chihuahuan Desert and the southern Great Plains. The soils at the site include sandy surface soils with intermittent deep sand range sites, to include windblown particles, a thin soil crust, and a layer of moist subsoil. These sandy soils form stabilized coppice dunes interspersed with swales.

Shrubs and grasses are the most prominent components of the local flora. The area is composed of combined Havard shin oak (oak shinnery) dune and grassland aspects that include perennial grasses (e.g., gramma, dropseed, 3-awns) and shrubs (e.g., Fourwing saltbush). These are typical grassland and shrub land species that dominate the flora of the area.

The area supports an abundant and diverse population of mammals. Black-tailed jackrabbits and desert cottontails are the most conspicuous. Other primary mammals include desert mule deer, desert dwelling rodents, and carnivores such as the coyote, gray fox, badger, and striped skunk.

A large variety of bird species are also found in the region. Densities vary according to food and habitat availability. Scaled quail, mourning dove, loggerhead shrike,

pyrrhuloxia, and black-throated sparrows are but a few examples of the array of bird inhabitants. The Harris hawk, Chihuahuan raven, Swainson's hawk, Northern harrier, and American kestrel are also found at the site.

Numerous varieties of amphibians and reptiles also occupy the vicinity. Characteristic reptiles in the region include the western box turtle, side-blotched lizard, western whiptail, bullsnake, and prairie rattlesnake. Representative amphibians are the tiger salamander, green toad, and plain's spadefoot.

A brief summary of the ecological baseline surveys appears in Appendix H of the Final Environmental Impact Statement (FEIS; DOE, 1980). Changes observed in the area ecology will be noted in the SER (DOE, 2003a).

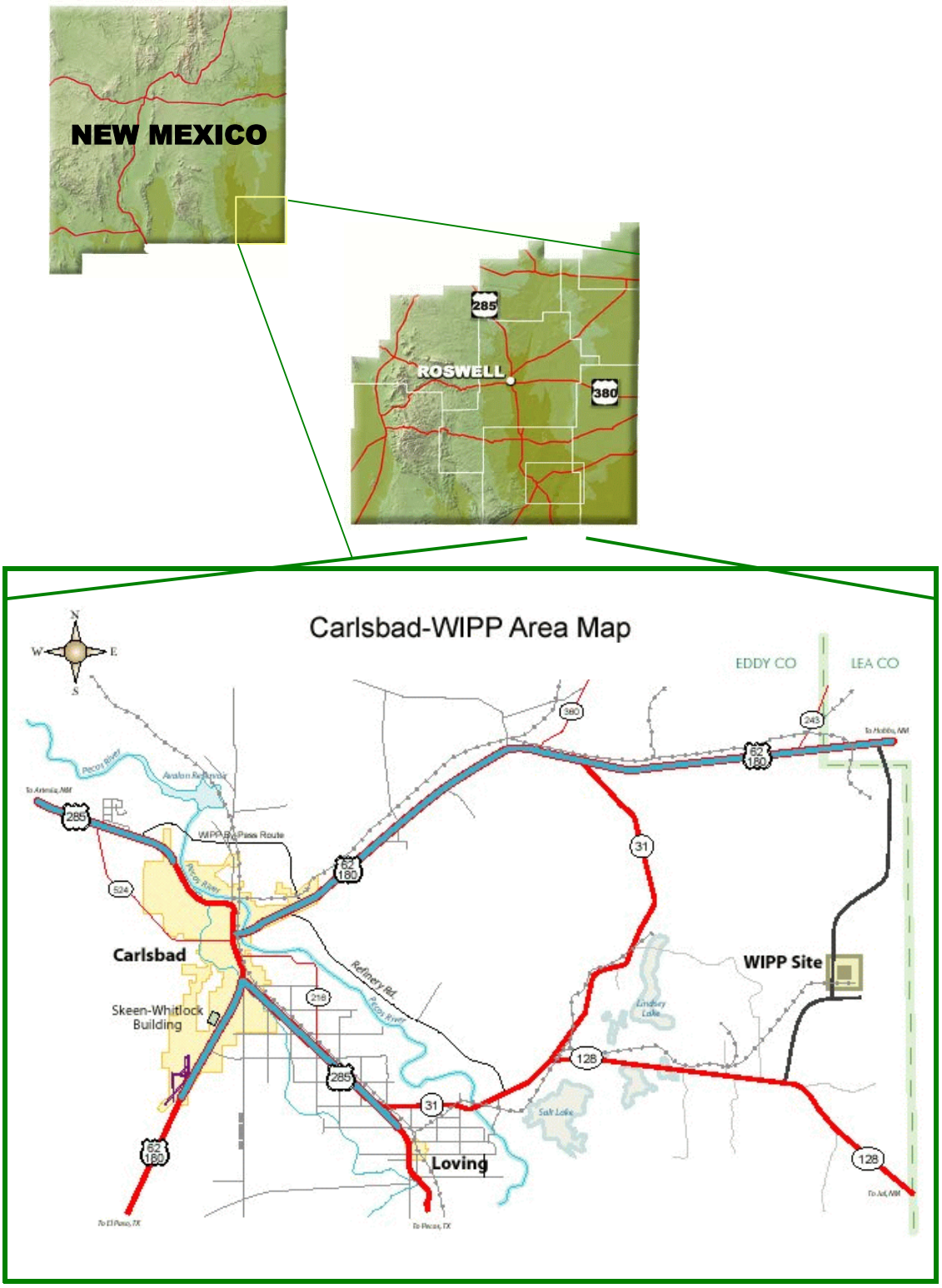

Figure 3-1 - Location of WIPP Site

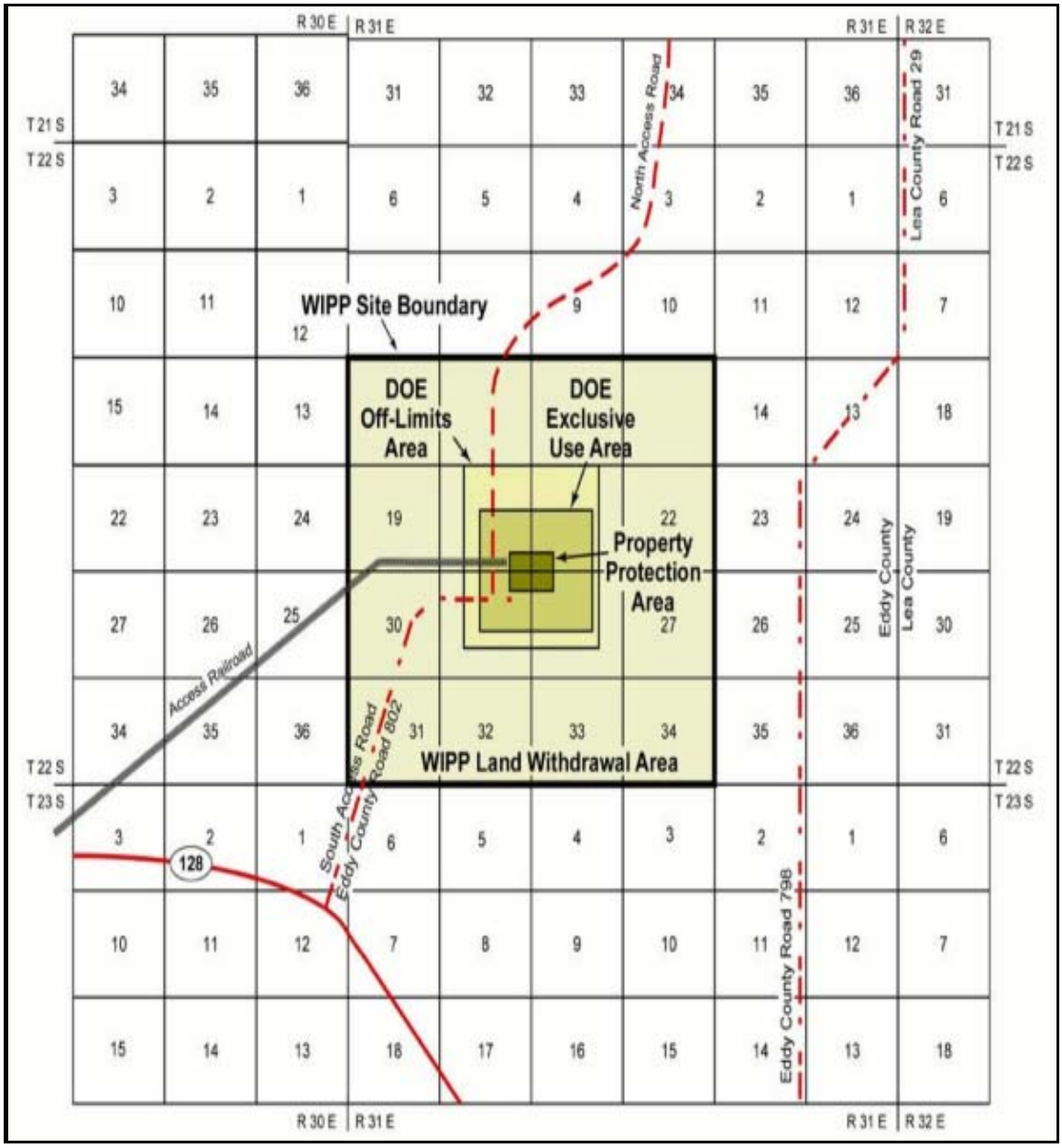

Figure 3-2 - Plat of WIPP Site

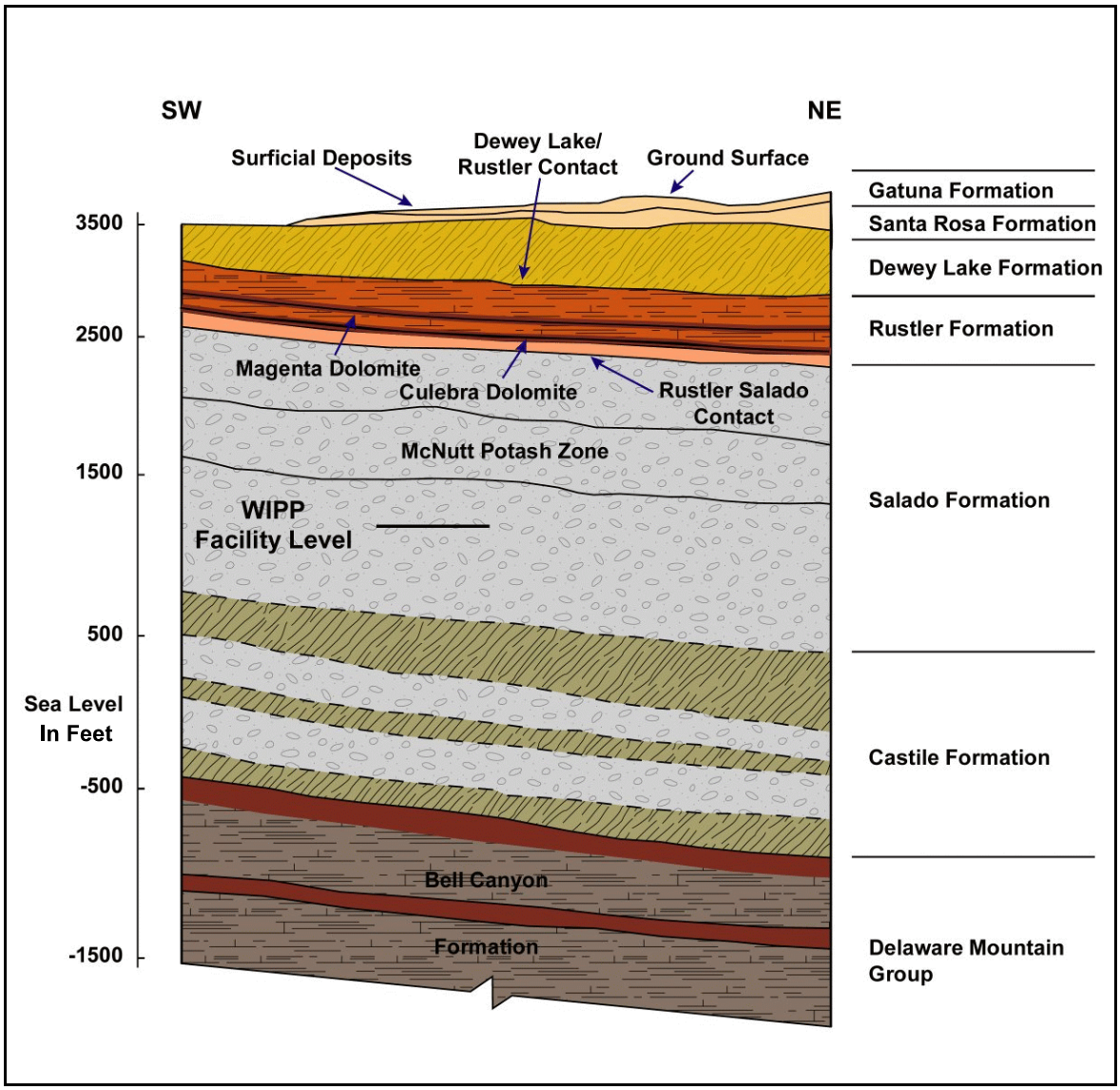

Figure 3-3 - Generalized Stratigraphy of the WIPP Site
(Not to Scale)

4.0 DOSE CALCULATIONS

This section discusses dose calculations involving off-site dose assessment. Sections 7.1.4.1 (On-Site Dose Assessment) and 7.1.4.2 (Off-Site Dose Assessment) of the WIPP Safety Analysis Report (SAR) (DOE, 1997a) state: "Waste containers accepted for disposal at the WIPP are expected to meet the 10 CFR Part 835 external contamination limits." Therefore, WIPP normal operations do not involve or entail any planned or expected releases of airborne radioactive materials.

The WIPP is in compliance with the reporting requirements established by 40 CFR Part 61, Subpart H, "National Emissions Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities," and a Memorandum of Understanding (MOU) dated May 16, 1995, between the U.S. Environmental Protection Agency and the Department of Energy regarding the provisions of the National Emission Standards for Hazardous Air Pollutants for radionuclides.

Emission monitoring and compliance procedures for DOE facilities (40 CFR §61.93[a]) require the use of CAP88-PC (Clean Air Act Assessment Package-1988) or AIRDOS-PC computer models, or other approved procedures, to calculate effective dose equivalents (EDEs) to members of the public. Calculations made utilizing the CAP88-PC indicate that the EDE to the maximally exposed individual resulting from normal operations conducted at the WIPP facility is well below the 10 mrem per year limit. This meets the requirements of 40 CFR Part 61, Subpart H, and 40 CFR Part 191, Subpart A, "Environmental Standards for Management and Storage," for periodic confirmatory sampling.

Nonradiological exposure to members of the public associated with potential airborne chemical releases from the WIPP facility during normal operations is not expected to occur. This expectation is based on the following three factors: (1) extensive site exposure measurements and calculations, which indicate that employee exposures are being maintained well below Occupational Safety and Health Administration permissible exposure limits (as stipulated in 29 CFR §1910.1000); (2) all chemicals used on site must receive approval prior to purchase, with approval based on the minimization of personnel exposure and environmental impact; and (3) nonradiological environmental monitoring activities are being conducted to document any changes in the environment.